AILS Presentation to the MSP Management Staff on 11/3/98

AILS

Several years ago NASA undertook a research program to develop flight deck technology for conducting simultaneous parallel approaches to closely spaced runways without the need for ground surveillance support, i.e. final monitors. NASA gave this research the name Airborne Information for Lateral Spacing or AILS. Other names used to identify this technology are called Closely Spaced Parallel Approaches (CSPA) presented by RTCA and Closely Spaced Parallel Approaches (CASPER) used by Honeywell. They all use the same basic technological concept.

GOAL AND OBJECTIVE

Currently, the standard minimum runway separation for independent operations is 4300 feet. With the exception of PRM, which as we all know allows independent operations to 3400 feet. The goal of AILS is to enable approaches to runways spaced as close as 2500 feet apart. This is in consideration of the wake turbulence restrictions.

The objective of AILS is to enable approaches to closely spaced parallel runways in IMC with a capacity similar to that obtained in VMC. And, to provide the means for airborne crews to take responsibility for lateral aircraft separation during closely spaced parallel approaches.

HOW

To do this, an accurate and reliable navigation system must be used, and an alerting and safety system must be developed to protect aircraft from threatening aircraft on the parallel approach that are deviating from their assigned course.

TECHNOLOGY

The AILS technology that NASA is developing is designed for the flight deck. It is composed of two main hardware elements: Differential Global Positioning System (DGPS) and Mode S data link such as Automatic Dependent Surveillance-Broadcast (ADS-B) that is currently under development. The DGPS provides the precision approach capability, and the ADS-B provides the means for aircraft to communicate with one another.

ALGORITHMS

The algorithms developed by NASA for AILS provides an alerting and resolution feature both visual and aural. It is designed to prevent an aircraft from straying from its airspace, and further, warns aircraft on the other approach of any potential threat, and provides direction for any necessary evasive action. The designed evasive maneuver is a 45-degree outbound turn away from the threatening aircraft.

DEVELOPERS AND SUPPORTERS

NASA---LaRC is the lead with support from ARC.
FAA---Provides technical support through AAR-210 and other organizations.
Honeywell, Inc.---Helps develop and integrate the algorithms into hardware.
RTCA---Disseminates information, examines how AILS technology will be used, and establishes standards. SC-186 (ADS-B).
Airlines---Eagerly awaiting relief from delays.

VALIDATION

October 1996, NASA conducted a workshop to present the AILS concept and disseminate results of the various test and simulation studies conducted to date. One of the many recommendations that came out of the workshop that has been included in the AILS Plan is to develop the ATC involvement in the AILS process

Various Monte Carlo analysis have been conducted to verify the robustness of the AILS alerting algorithms. Currently, the FAA is scheduled to conduct a Monte Carlo analysis of these algorithms as well.

A Integrated Flight Deck (IFD) simulation study to test how quickly flight crews respond to AILS alerting algorithms has been conducted by NASA. Flight crews from various airlines were used for this test.

NASA aircraft to validate the accuracy of the DGPS has conducted flight tests.

WHY AILS

Most airports with closely spaced parallel runways loose significant capacity during IMC. These airports depend on the parallel runway operation to achieve capacity in their day to day operation. When this isn't accomplished it significantly cost the airlines as well as other related businesses and the flying public. This equates to a lost of millions of dollars to the airlines. The other two that I mentioned are difficult to quantify.

PLANS

On going fine tune AILS algorithms, develop AILS hardware, and design a realistic simulation scenario.

April 1999, NASA will conduct a simulation using airline flight deck crews and a robust set of simulation scenarios that will test the airborne system and components in a flight environment.

August 1999, NASA with assistance from Honeywell will conduct a flight test at the NASA Wallops Flight Facility. NASA will use their B757 and Honeywell will use their G-4. Both aircraft will be retrofitted with the AILS technology.

September 1999, NASA with assistance from Honeywell will conduct a flight demonstration at a revenue airport. MSP is an excellent choice because of Honeywell's involvement and support and the existence of a DGPS on site.